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ABSTRACT

Reasons for occupational mobility are imperfect occupational matching, search, exogenous changes in the market or in the person, and movement along a career path. A positive or negative relationship between the level of schooling and occupational mobility depends on the type of mobility involved. Higher levels of schooling lead to careers comprised of a smaller number of occupations, thus reducing the probability of other types of mobility. This negative effect of schooling decreases with time in the labor market. Schooling also has a negative effect on the probability of upward mobility. However, when a control for the occupation of origin is performed, it is found that among workers in the same occupational group, the more educated are more likely to move up. The schooling effect is much stronger on intra-firm career mobility ("promotion") than on inter-firm career mobility. Given job turnover, more educated workers are also more likely to move up. This observation is partially explained by the fact that among those who leave the firm, the ratio of quits to layoffs increases with the level of schooling and also by the fact that among workers who are laid off, the more educated are more likely to move up. In addition, if the returns to schooling (in terms of wages) are lower while working in a specific occupation, the effect of schooling on the probability of being promoted from that occupation will be higher. (17 references) (Author/YLB)

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EDUCATION AND OCCUPATIONAL MOBILITY

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PREFACE

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EDUCATION AND OCCUPATIONAL MOBILITY

I. INTRODUCTION.

The past several decades have witnessed a steady expansion of research on the causes and consequences of labor mobility. This research has been guided by three dominant theoretical perspectives: specific human capital theory, search theory, and matching theory. Although these theories differ from one another in terms of what variables they view as important determinants of mobility, they share one common assumption; they all view mobility as a response to the arrival of new information (i.e., as unplanned). While much mobility is indeed unplanned, some mobility, specifically that accompanied by occupational change, may be part of an optimal career path. Due to transferability of skills between different occupations, an optimal career path may involve planned transitions between occupations.[1] These three theories of labor mobility do not address such planned episodes of occupational mobility and interfirm mobility.

One important question addressed in the literature on mobility is the effect of schooling on labor turnover. The distinction between unplanned mobility and planned mobility accompanied by occupational change is crucial for understanding the effect of education on labor mobility. In this paper I argue that the effect of education on labor mobility that is accompanied by planned occupational change is different from the effect of education on unplanned mobility.

The broader objective of this paper is to estimate the effect of education on the likelihood of occupational mobility. The effect of education on mobility might vary, depending on the reason for mobility and the type of occupational transition involved.

In section II of the paper, I discuss the different effects of schooling on occupational mobility as implied by the different theories, focusing on mobility along a career path. The resulting implications for firm mobility and the schooling effect on wages are also discussed.

In section III, an econometric model is developed in order to estimate the effect of schooling and other variables on the likelihood of different types of occupational mobility.

In section IV, career mobility, defined as a mobility to a higher level occupation, is decomposed into that which takes place within the firm ("promotion") and that which takes place across firms. The differences in the schooling effects on the different types of mobility are analyzed.

Section V presents and tests the hypothesis that differences in the schooling effect on wages in different occupations can be explained by differences in the schooling effect on the probability of promotion from the different occupations.

Section VI summarizes the major findings of this paper.

II. THE DIFFERENT TYPES OF OCCUPATIONAL MOBILITY AND ITS CORRELATIONS WITH EDUCATION.

There are several reasons for occupational mobility. These reasons are imperfect occupational matching, search, exogenous changes in the market or in the person (e.g., health changes), and movement along a career path. Whether to expect a positive or negative relationship between the level of schooling and occupational mobility will depend on the type of mobility involved.[2]

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[1] See Rosen (1972) and Sicherman and Galor (1990).

[2] I will not discuss in this paper occupational mobility that is due to changes in the economy or the worker.

Occupational mobility due to imperfect occupational matching may occur because people have incomplete information about the nature of chosen occupations.[3] Complete information may be revealed by actual work in that occupation. Alternatively, if the costs of entering the primary choice occupation are too high, some information may be gained by working in a closely related occupation. Occupational mobility will be observed if there is not a good match between the worker and the occupation. If higher levels of education are characterized by higher degrees of occupational specialization, more educated workers will be less likely to change occupations due to an occupational mismatch. Furthermore, for occupations which require a large investment in schooling, part of the search can take place at college by changing fields of study, thereby reducing the chance that a mismatch will occur. (See Bureau of Social Science Research [1963]; Davis [1964]; and Bamberger [1986].)

Search theory has primarily focused on job (employer) change without specific inference to occupational change. Since search theory does not demonstrate a clear correlation between schooling and mobility, the same ambiguity might be implied about the effect of schooling on occupational mobility due to occupational search.[4]

The third type of occupational mobility is due to career mobility, defined as a mobility across a series of occupations, linked through the transferability of skills and experience from one occupation to the other. Such mobility can take place within firms or across firms, forming an optimal sequence of occupations over the life cycle.[5]

Career mobility theory yields several predictions concerning the effect of schooling on occupational mobility that are not implied by matching or search theories. Immediately below, I briefly discuss these predictions. A further discussion and estimation of these predictions will be a focal point in this paper.

If careers of more educated workers are more likely to be characterized by fewer distinct occupations, a negative correlation between occupational mobility and schooling will result. If, in a given occupation, the more educated workers are also more likely to get promoted or to move upward across firms, a positive correlation between education and upward occupational mobility (especially promotion) is predicted, after controlling for the occupation of origin.[6]

Another prediction concerns the concurrent effect of education on wages and mobility. In a career mobility framework schooling has two effects. As in a standard human capital framework, schooling has a positive effect on wages. In addition, schooling increases the probability of moving to a higher level occupation. What I suggest and test empirically is there is a tradeoff between these two effects. While in some occupations the returns to schooling are in a form of higher wages, in other occupations the returns are in term of higher probabilities of advancing to higher level occupations. This hypothesis can explain the observed differences in returns to schooling across occupations. If the returns to schooling in terms of wages are lower while working in a specific occupation, the effect of schooling on promotion from this occupation (within or across firms) will be higher.

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[3] See Miller (1984). His model integrates both matching and search theories.

[4] Within the framework of job search theory there is no clear prediction concerning the relationship between schooling and the likelihood of finding a better job. More educated workers are likely to face a higher arrival rate of job offers because they face a larger labor market, a larger variety of jobs, and are more efficient in seeking a new job while employed or unemployed (see Mincer 1988). But since more educated workers will also have a higher reservation wage, the effect of schooling on departure is ambiguous. However, as Flinn and Heckman (1983) demonstrate, if the wage offer distribution is log concave, higher arrival rates of wage offers imply higher departure rates. Several examples of lob concave distributions are given in their paper and the normal distribution is one of them.

[5] For similar definitions of careers see Spilerman (1977) and Sommers and Eck (1977). For a theoretical treatment of career mobility see Galor and Sicherman (1988).

[6] See Galor and Sicherman (1988) for a formal model.

By understanding the relations between the level of schooling and career mobility, it will be possible to get a better understanding of the relations between schooling, firm mobility, and wage growth.

IV. AN ECONOMETRIC MODEL OF OCCUPATIONAL MOBILITY

In this section two questions are addressed: (1) what is the effect of schooling on occupational mobility after controlling for observed heterogeneity in workers' characteristics, and (2) what are the differences in the schooling effect when *upward* occupational mobility is considered?

Two models are estimated. One is a model of "occupational mobility" in which there is no distinction between different types of mobility, and the other is a model of "career mobility" (or "upward mobility"), where the estimated hazard is an upward occupational transition.

At each period (between two successive surveys), the worker can be observed changing occupations or not. An occupational change can be to a higher or lower occupation. Consider therefore the following models:

$$Y^{*}_{ijt} = X_{it}\beta + \alpha ED_i + \tau(ED_i{*}EXP_{it}) + \delta_j + \varepsilon_{ijt} , \quad (1)$$

$$Y''^{*}_{ijt} = X_{it}\beta' + \alpha' ED_i + \tau(ED_i{*}EXP_{it}) + \delta'_j + \varepsilon'_{ijt} , \quad (2)$$

where

Y^{*}_{ijt} ≡ the probability that the worker i in occupation j at time t will change occupation ,

and

Y''^{*}_{ijt} ≡ the probability that the worker will move to a higher level occupation.

X_{it} is a vector of individual characteristics which may vary across time. ED_i is the level of schooling. $(ED_i{*}EXP_{it})$ is the interaction between the level of schooling and market experience. The inclusion of this interaction allows the education effect to vary across experience levels. δ_j is the occupation fixed effect. It is assumed to be constant across time and across individuals, and can, therefore, be estimated by including occupational dummies.

Mobility (y=1) occurs when the latent variable $Y^{*}_{ijt} > 0$ ($Y''^{*}_{ijt} > 0$), where

$$Y^{*}_{ijt} = \begin{cases} 1 \text{ if the worker changed occupation between two surveys,} \\ 0 \text{ otherwise.} \end{cases}$$

$$Y''^{*}_{ijt} = \begin{cases} 1 \text{ if the worker moved "up" between two surveys,} \\ 0 \text{ otherwise.} \end{cases}$$

Since Y^{*}_{ijt} (Y''^{*}_{ijt}) is unobserved, the probability of a transition is prob(y=1) = 1 - F(-ZΓ), where F( ) is the CDF of ε. In practice I assume that ε is logistically distributed and estimate the parameters by maximum likelihood.

The data set used for the empirical analysis is drawn from the Panel Study of Income Dynamics (PSID). The data set is described in Appendix C. Appendix B describes the derivation of the vertical ranking of occupations used, and Appendix A lists the occupations which are used. For more details concerning the data set and the occupational ranking, the reader is referred to Sicherman and Galor (1990).

Table 1 presents the estimation results of the two models presented above, with and without the occupational dummies.

TABLE I
OCCUPATIONAL MOBILITY AND UPWARD OCCUPATIONAL MOBILITY
MAXIMUM LIKELIHOOD (LOGIT) MODELS

Observations: 13324
Mean of dependent variable: 0.295 0.149

Sample:	OCCUPATIONAL MOBILITY				UPWARD MOBILITY			
	(a)	(b)*	(c)	(d)*	(e)	(f)*	(g)	(h)*
INTERCEPT	0.3359	.06989	1.0559	.21970	-4.4184	-.56042	-0.1299	-.01647
	(1.36)		(5.40)		(13.0)		(0.55)	
SCHOOLING	-0.0477	-.00993	-0.0840	-0.21970	0.1336	.01694	-0.0696	-.00883
	(3.04)		(6.01)		(6.36)		(4.05)	
EXPERIENCE	-0.0629	-.01308	-0.0729	-.01517	-0.0045	-.00057	-0.0641	-.00814
	(5.05)		(5.95)		(0.27)		(4.18)	
EXPERIENCE^2	.00066	.00014	.00074	.00015	0.0001	.00002	0.0007	.00009
	(3.13)		(3.53)		(0.61)		(2.65)	
SCHOOLING*EXP	.0011	.00024	0.0018	.00037	-0.0020	-.00025	0.0011	.00014
	(1.78)		(2.90)		(2.28)		(1.39)	
TENURE	-0.0622	-.01294	-0.0669	-.01392	-0.0339	-.00430	-0.0668	-.00847
	(7.40)		(8.08)		(2.96)		(6.24)	
TENURE^2	0.0017	.00035	0.0016	.00034	0.0014	.00018	0.0018	.00023
	(5.51)		(5.49)		(3.39)		(4.75)	
UNION	-0.0912	-.01897	-0.0486	-.01012	-0.2966	-.03761	0.0608	.00771
	(1.92)		(1.07)		(4.74)		(1.06)	
SMSA	-0.1033	-.02150	-0.0984	-.02049	0.0270	.00343	-0.0825	-.01047
	(2.39)		(2.32)		(0.47)		(1.53)	
MARRIED	-0.0668	-.01391	-0.0895	-.01863	0.1266	.01605	-0.0100	-.00127
	(1.26)		(1.70)		(1.81)		(0.15)	
DISABLED	-0.0540	-.01124	-0.0508	-.01058	-0.0583	-.00739	0.0209	.00266
	(0.81)		(0.76)		(0.67)		(0.25)	
RACE	0.1066	.02219	0.1618	.03367	-0.3287	.04169	0.1140	.01446
(1=BLACK)	(2.27)		(3.56)		(5.32)		(2.00)	
OCCUPATIONAL DUMMY								
MANAGERS, NOT S.E.	0.1511	.03144			-0.0258	-.00327		
	(1.77)				(0.16)			
SELF-EMP. BUSINESS	0.7116	.14810			1.3888	.1762		
	(5.63)				(7.46)			
CLERICAL AND SALES	0.1868	.03886			1.4078	.1786		
	(2.16)				(10.8)			
CRAFTSMAN/FOREMEN	0.2526	.05257				1.0142	.1286	
	(3.18)				(7.77)			
OPERATIVES	0.2803	.05833			2.1216	.2691		
	(3.35)				(16.5)			
LABORERS & SERVICE	0.5845	.12160			3.0264	.3839		
	(6.42)				(22.4)			
FARMRS & FARM MANAGERS	-0.9449	-.19664			-1.1658	-.14787		
	(3.99)				(1.96)			
ARMY	-0.0180	-.00375			0.4916	.06235		
	(0.10)				(1.69)			
Log Likelihood	-9236		-7790		-4927		-5458	

Absolute t statistics in parentheses.
* Columns (b), (d), (f) and (h) report the estimated derivatives for the probabilities ($\beta P(1-P)$).
The dependent variables are measured between t-1 and t. All level variables are measured in (t-1). Excluded are observations with the highest ranked occupation.

The first four columns show the effects of education on all occupational transitions. The results indicate that more educated workers are less likely to change occupations. The schooling coefficient is much smaller when occupational dummies (1 digit classification) are included,[7] but the negative effect and its significance remain. As the level of market experience increases, the negative correlation between schooling and occupation mobility becomes smaller.

A quadratic term of schooling is not included in the results presented in Table 1 because it was found to be insignificant. It is interesting to point out that if the interaction between schooling and experience is excluded, the schooling effect becomes significantly non-linear. It is positive up to 8 or 9 years of schooling and negative with higher levels of education.

The significant effect of the occupational dummies confirms the hypothesis that the occupation of origin is important in predicting the likelihood of mobility. The only category that has lower rates of mobility than professionals is "farmers and farm managers." All other categories (except soldiers) have higher rates of occupational mobility, after controlling for different personal characteristics. Self-employed businessmen seem to have the highest rates of occupational mobility, with laborers and service workers ranked after them.

The last four columns of Table 1 show the effect of schooling on upward mobility. The results are quite different from those in the first four columns. Without controls for the occupation of origin, the schooling effect is similar to that described earlier, namely, negative and decreasing with experience. But after controlling for the occupational category of origin, the schooling effect is **positive** and significant (the interaction of schooling with experience is not significant). This observation confirms the hypothesis made earlier that *in the same occupational category, the more educated workers are more likely to move to a higher level occupation.*[8] This result is discussed in detail in section VI.

The next section examines the determinants of career mobility in more detail. The differences between mobility within and across firms will be analyzed, and some conclusion concerning the schooling effect on wages will be made.

V. CAREER MOBILITY WITHIN AND ACROSS FIRMS

In this section three models are estimated: One is a model of total career Mobility, in which there is no distinction between inter and intra firm transitions. This total mobility is then decomposed into transitions that occur **within the firm** (promotion)[9], and those that occur **across firms**.

Observed occupational transition can result in a movement to a higher level occupation, or a lower one. Since the scaling of occupations is continuous (see Appendix B) horizontal mobility does not occur. Therefore, the three dependent variables in the three models estimated are defined as follows:

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[7] The excluded group in the regressions is "Professionals, Technical and Kindred Workers."

[8] It should be noted that the occupational dummy is for 1 digit classification, wile occupational mobility is defined based on 2 digit classification.

[9] "Promotion" is usually defined as "moving through grade levels within the firm" (see Wise [1975] for example). Here we take a different approach mainly because our interest is in occupational mobility, namely, the tasks performed in the two positions are different enough to fall under different occupational categories.

"Career Mobility" [= 1 if the worker moved to a higher level occupation between two surveys.
= 0 otherwise.

"Promotion" [= 1 if the worker moved to a higher level occupation and stayed in the firm.
= 0 otherwise.

"Across Firms" [= 1 if the worker moved to a higher level occupation and changed firm.
= 0 otherwise.

Table 2(a) presents the estimates of the three models. Column (a) is similar to column (e) in Table 1, with the exclusion of the interaction between schooling and experience.

The theory of career mobility (Sicherman and Galor, 1990) predicts two opposite effects of schooling on career mobility. Since more educated workers can start their working career in higher level occupations, their careers might involve a fewer number of distinct occupations than less educated workers. In addition, high skill careers might involve fewer changes in tasks over time which will cause more educated workers to have less transitions. On the other hand, given the occupation of origin, more educated workers are more likely to move to higher level occupations (within or across firms).

Without a control for occupation of origin (see Table 2(b)), schooling has a *negative* effect on career mobility. This result indicates that careers of more educated workers are more likely to be comprised of a smaller number of distinct occupations. In the estimation results reported in Table 2(a), a control for 1 digit occupation of origin is performed. There it is shown that schooling has a *positive* effect on career mobility within and across firms[10]. In order to further examine the role of schooling on career mobility when firm separation takes place, the career mobility model was estimated on a sub-sample of workers who changed firms. In Table 3 the estimation results of the model are reported for all workers who changed firms and separately for those who quit and those who were laid off.

Given firm separation, more educated workers are also more likely to move up. This observation is partially explained by the fact that among those who leave the firm, the ratio of quits to lay-offs increases with the level of schooling (see Mincer [1989]). Nevertheless schooling increases the likelihood of upward mobility both in the case of a quit and in the case of lay-offs (but the effect is much larger in the case of a quit).

The schooling effect on the probability of career mobility will vary, depending on the type of career and the occupation of the worker. In the next section we analyze the differences in the returns to schooling across occupations.

Schooling has a positive effect on the probability of moving to a higher level occupation (after controlling for observed individual characteristics and occupational category[11]). This effect is much stronger in the promotion model than in the "across firms" model.

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[10] A similar observation is made with regard to black workers. On average they are *more* likely to move to a higher level occupation. Controlling for occupation of origin, the race dummy becomes *negative*. See Galor and Sicherman (1988) for a discussion on race and other variables in the career mobility models.

[11] It should be noted that in both Table 3 and Table 4 a control for 1 digit occupational category is performed. In Table 5 an interaction between schooling and 2 digit occupational dummies is performed, without a separate control for occupation of origin (see footnote 17).

TABLE 2(a)
MAXIMUM LIKELIHOOD LOGIT MODELS OF CAREER MOBILITY WITHIN AND ACROSS FIRMS

Dep. Var.:	CAREER MOBILITY		PROMOTION		ACROSS FIRMS		SAMPLE MEANS (S.D.)
Mean of dependent Variable (P):	.149		.103		.046		
# of obs.: 13324							
	(a)	(b)*	(c)	(d)*	(e)	(f)*	(g)
INTERCEPT	-3.8879	-.49313	-4.3856	-.40457	-4.8686	-.21468	
	(15.8)		(15.8)		(10.8)		
SCHOOLING	0.0954	.01211	0.0837	.00773	0.0857	.00378	12.177
	(7.53)		(5.87)		(3.92)		(2.91)
EXPERIENCE	-0.0337	-.00427	-0.0391	-.00361	0.0036	.00016	16.066
	(3.21)		(3.24)		(0.20)		(10.8)
EXPERIENCE^2	0.0003	.00004	0.0005	.00005	-0.0006	-.00003	
	(1.31)		(1.83)		(1.20)		
TENURE	-0.0335	-.00425	0.0424	.00392	-0.2518	-.01111	6.9266
	(2.93)		(3.30)		(9.49)		(8.02)
TENURE^2	0.0013	.00017	-0.0007	-.00007	0.0060	.00026	
	(3.26)		(1.59)		(5.27)		
UNION	-0.2932	-.03719	-0.1054	-.00973	-0.6139	-.02707	.2697
	(4.69)		(1.53)		(5.18)		
SMSA	0.0235	.00299	-0.0319	-.00295	0.0981	.00432	.6755
	(0.41)		(0.49)		(1.01)		
MARRIED	0.1345	.01706	0.3627	.03346	-0.2259	-.00996	.8311
	(1.92)		(4.26)		(2.20)		
DISABLED	-0.0570	-.00723	0.1003	.00925	-0.4384	-.01933	.1017
	(0.65)		(1.03)	(2.89)			
RACE	-0.3280	-.04160	-0.2049	-.01890	-0.4486	-.01978	.2960
(1=BLACK)	(5.31)		(2.93)		(4.41)		
L Likelihood	-4929		-4081		-2032		
Mean of dep. Variable (P):	.149		.103		.046		
No. of observations: 13324							

Absolute t statistics in parentheses.

* Columns (b), (d), and (f) report the estimated derivatives for the probabilities ($\beta P(1-P)$).

The regressions also include dummy variables for 1 digit occupational category.

The dependent variables are measured between t-1 and t. All level variables are measured in (t-1).

Excluded are observations with the highest ranked occupation.

Table 2(b)
MAXIMUM LIKELIHOOD LOGIT MODELS OF CAREER MOBILITY WITHIN AND ACROSS FIRMS
(No control for occupation of origin)

Dep. Var.:	CAREER MOBILITY (a)	(b)*	PROMOTION (c)	(d)*	ACROSS FIRMS (e)	(f)*
INTERCEPT	-0.3789	-.04805	-1.4773	-.13628	-0.8203	-.03617
	(2.41)		(7.99)		(3.11)	
SCHOOLING	-0.0502	-.00637	-0.0376	-.00347	-0.0601	-.00265
	(4.99)		(3.24)		(3.37)	
EXPERIENCE	-0.0479	-.00607	-0.0525	-.00484	-0.0149	-.00066
	(4.78)		(4.46)		(0.87)	
EXPERIENCE^2	0.0006	.00008	0.0008	.00007	-0.0003	-.00002
	(2.34)		(2.70)		(0.74)	
FIRM TENURE	-0.0674	-.00855	0.0096	.00089	-0.2949	-.01300
	(6.30)		(0.79)		(11.8)	
FIRM TENURE^2	0.0018	.00024	-0.0002	-.00001	0.0069	.00030
	(4.87)		(0.38)		(7.11)	
UNION	0.0615	.00781	0.2050	.01891	-0.3029	-.01335
	(1.07)		(3.18)		(2.68)	
SMSA	-0.0814	-.01032	-0.1065	-.00983	-0.0417	-.00184
	(1.51)		(1.71)		(0.45)	
MARRIED	-0.0154	-.00195	0.2326	.02146	-0.3499	-.01543
	(0.23)		(2.82)		(3.57)	
DISABLED	0.0192	.00243	0.1505	.01388	-0.3353	-.01479
	(0.23)		(1.59)		(2.28)	
RACE (1=BLACK)	0.1141	.01447	0.1561	.01440	-0.0145	-.00064
	(2.01)		(2.35)		(0.15)	
L Likelihood	-5459		-4370		-2224	
Mean of dependent variable (P):	.149		.103		.046	

No. of observations: 13324

Absolute t statistics in parentheses.

* Columns (b), (d), and (f) report the estimated derivatives for the probabilities ($\beta P(1-P)$).

The dependent variables are measured between t-1 and t. All level variables are measured in (t-1).

Table 3
CAREER MOBILITY OF WORKERS WHO CHANGED FIRM
Maximum Likelihood (Logit) Estimation

Dependent Variable: 1=if moved to a higher level occupation, 0=otherwise
Sample: Only workers who changed firms.

Sample:	All Who Changed Firm		Quit		Laid-off	
	Coeff.	Prob.*	Coeff.	Prob.	Coeff.	Prob.
INTERCEPT	-4.8301	-.91853	-5.3902	-1.066	-4.0280	-.72821
	(9.16)		(7.68)		(4.72)	
YEARS OF SCHOOLING	0.1332	.02533	0.1676	.03313	0.1039	.01878
	(5.01)		(4.68)	(2.46)		
(MARKET) EXPERIENCE	0.0238	.00453	0.0527	.01042	0.0026	.0004
	(1.15)		(1.73)		(.089)	
EXPERIENCE^2	-0.0007	-.00014	-0.0019	-.0003	.00005	.00000
	(1.33)		(2.19)		(.071)	
FIRM TENURE	0.0375	.00714	0.0597	.01182	0.0176	.00319
	(1.10)		(1.42)		(0.26)	
TENURE^2	-0.0019	-.00036	-0.0012	-.0002	-0.0043	-.0007
	(1.18)		(.671)		(.951)	
UNION	-0.1971	-.03748	-0.2663	-.05265	-0.0645	-.01166
	(1.37)		(1.29)		(.308)	
SMSA	-0.0089	-.00169	-0.0458	-.00905	-0.005	-.00096
	(0.07)		(.293)		(.029)	
MARRIED	0.0655	.01246	0.0910	.01799	0.0164	.00296
	(0.52)		(0.53)		(.088)	
DISABLED	-0.2334	-.04438	-0.2493	-.04930	-0.1700	-.03074
	(1.32)		(.989)		(.664)	
RACE (1= black)	-0.5391	-.10253	-0.4959	-.09806	-0.6009	-.10864
	(4.32)		(.893)		(3.11)	
QUIT	0.2175	.04135				
	(2.00)					
OCCUPATIONAL DUMMY (OMITTED CATEGORY: PROFESSIONALS):						
MANAGERS, NOT S.E.	0.3585	.06818	0.4859	.09609	0.1860	.03362
	(1.00)		(1.11)		(0.29)	
SELF-EMP. BUSINESSMEN	1.7773	.33800	1.8950	.3748	1.7309	.3129
	(4.26)		(3.49)		(2.54)	
CLERICAL AND SALES	1.8354	.34900	2.0114	.3978	1.5661	.2831
	(5.94)		(5.38)		(2.75)	
CRAFTSMEN/FOREMEN	1.0069	.19150	1.4104	.2789	0.2862	.05174
	(3.25)		(3.69)		(0.52)	
OPERATIVES	2.5192	.47910	2.7678	.5473	2.0981	.3793
	(8.33)		(7.28)		(3.99)	
LABORERS & SERVICE	3.7872	.72020	3.8640	.7641	3.6023	.6512
	(11.9)		(9.68)		(6.61)	
FARMERS & FARM MANAGERS	0.8701	.16550	1.3442	.2658	-5.0332	-.90992
	(0.79)		(1.17)		(.200)	
ARMY	1.0161	.19320	0.9047	.1789	0.9407	.1701
	(1.83)		(0.81)		(1.28)	
Log Likelihood:	-1142.6		-622.49		-479.95	
No. of observations:	2412		1260		1089	

VI. THE SCHOOLING EFFECT ON WAGE AND THE PROBABILITY OF PROMOTION

The schooling effect on the probability of career mobiiity will vary, depending on the type of the worker's career and the occupation.

Table 4 presents the estimates of the partial effect of schooling on the probability of career mobility, given the occupation of origin (estimated by interacting schooling with 2 digit occupational dummies). It can be seen immediately that the coefficients vary across occupations, both in magnitude and in level of significance. Below I suggest an explanation to this variation.

Returns to schooling can be realized through two channels. One is in the form of higher wages (immediate gain) and the other is in the form of a higher probability of moving to a higher level occupation (long run gain). One implication of this idea is that observed returns to schooling (i.e., wages) will be lower for occupations which provide good opportunities for upward mobility, and higher for occupations which have limited opportunities for advancement.

Human capital theory is a life cycle theory, and returns to schooling should be estimated accordingly. Therefore, I suggest that a possible explanation for the observed differences in returns to schooling across occupations may be due to the differences in promotion probabilities across occupations.[12]

In the following, I test the hypothesis that *if the returns to schooling are lower while working in a specific occupation, the effect of schooling on the probability of being promoted from that occupation will be higher.*[13]
Consider the following fixed effect models:

$$Y^{*}_{ijt} = X_{ijt\beta 1} + \tau_j ED_i + \delta_j + \varepsilon_{ijt} \qquad (2)$$
$$\ln(W_{ijt}) = X_{ijt\beta 2} + \alpha_j ED_i + \mu_j + \varepsilon'_{ijt} \qquad (2\text{-}1)$$

Equation (2) is a career mobility equation where the schooling effect (τ_j) is occupation specific. Equation (2-1) is a standard wage regression.

Here again I assume occupational fixed effects, estimated by using dummy variables (δ_j and μ_j). It is assumed that the effect of schooling on wage is occupation specific (α_j).

The following is implied by our hypothesis and will be tested empirically:

$$Corr(\alpha_j , \tau_j) < 0 \qquad (3)$$

Estimates of α_j and δ_j are presented in table 4.

The estimated correlation between the effect of schooling on wages in the occupation and its effect on the probability of moving to a higher level occupation is **-.61** (with .95 level of confidence).

Since each of the coefficients is measured with a different level of error (see the standard errors in the regressions), it can be shown that the measured correlation given above is *underestimated.* This conclusion is based on the assumption that the estimation errors are independent. However, the two sets of returns are derived from the same sample, this assumption might not hold. In order to ensure such an independence, I divided the data into two random sub-samples and re-estimated the regressions using a different sub-sample for each regression. The estimated correlation between the two sets of returns this time was **-.53** and again significantly different from zero. The reduction in the correlation is the result of avoiding the positive correlation between the regressions estimated errors and/or the increase in the standard errors of the estimated coefficients due to the smaller number of observations.

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[12] For a theoretical treatment of this hypothesis see Rosen (1972) and Galor and Sicherman (1988).

[13] This hypothesis, if true, works as an evidence against the view that lower returns to schooling are a reflection of "overeducation," in the sense that there exists a pool of "under-utilized" workers (see, for example, Freeman (1976)). For more details, see Sicherman (1987b).

TABLE 4
THE SCHOOLING EFFECT ON CAREER MOBILITY AND WAGE
The interaction between schooling and occupational dummies
in the Career Mobility (Logit) and the wage regressions.

OCCUPATIONAL CATEGORY	CAREER MOBILITY MODEL* Coeff (a)	Prob. (b)	WAGE MODEL (c)
10 PHYSICIANS, DENTISTS	.0922		
	(7.88)		
11 OTHER MEDICAL AND PARAMEDICAL	.05784	.0073	.0594
	(0.94)		(2.28)
12 ACCOUNTANTS AND AUDITORS	-.06144	-.0078	.0780
	(0.82)		(3.44)
13 TEACHERS, PRIMARY AND SECONDARY SCHOOLS	.02647	.0033	-.0028
	(0.45)		(0.14)
14 TEACHER(COLL.),SOC. SCI.,LIBRARIAN, ARCH.	-.06757	-.0086	.0686
	(0.84)		(2.58)
15 ARCHITECT, CHEMIST, ENGINEER, PHY. & BIO. SCI.	-.14642	-.0186	.0755
	(1.73)		(7.90)
16 TECHNICIANS	.1175	.0149	.0501
	(1.84)		(6.33)
17 PUBLIC ADVISORS	.05762	.0073	.0605
	(0.93)		(5.21)
18 JUDGES, LAWYERS	-.33584	-.0426	.3487
	(0.98)		(3.24)
19 PROF, TECHNICAL & KINDRED, NOT ABOVE	.1564	.0198	.0237
	(2.69)		(1.20)
20 MAN., OFFIC. & PROPR. (NONFARM) EXC. SELF-EM.	.3885	.0493	.0739
	(5.15)		(19.6)
31 LIKE 20, SELF-EMPLOYED (UNINCORP. BUS.)	.2153	.0273	.0681
	(3.26)		(6.77)
40 SECRETARIES, STENOGRAPHERS, TYPISTS	.1138	.0144	-.0627
	(2.19)		(1.40)
41 OTHER CLERICAL WORKERS	.1426	.0181	.0308
	(3.48)		(5.09)
45 SALES WORKERS	.07513	.0095	.1064
	(1.98)		(12.5)
50 FOREMEN, N.E.C.	.2164	.0274	.0372
	(6.08)		(4.29)
51 OTHER CRAFTSMEN & KINDRED WORKERS	.1953	.0248	.0371
	(5.85)		(12.7)
52 GOVT (FIRE, POLICE, MARSH. & CONSTABLES)	.1176	.0149	.0429
	(2.71)		(3.10)
55 MEMBERS OF THE ARMED FORCES	.06732	.0085	.0830
	(0.43)		(6.06)
61 TRANSPORT EQUIPMENT OPERATIVES	.05677	.0072	.0336
	(2.32)		(7.21)
62 OPERATIVES, EXCEPT TRANSPORT	.1198	.0152	.0437
	(5.09)		(13.3)
70 UNSKILLED LABORERS (NONFARM)	.1101	.0140	.0382
	(5.18)		(9.30)
71 FARM LABORERS AND FOREMEN	.08899	.0113	.0446
	(3.12)		(4.90)
75 OTHER SERVICE WORKERS	.04436	.0056	.0311
	(2.17)		(6.12)
80 FARMERS (OWNER & TENANT) & MANAGERS	.06254	.0079	.0666
	(0.30)		(2.79)

* The Logit parameter estimates are in (a), and the derivatives for the probabilities are reported in (b) (calculated as $\beta[p(1-p)]$). The other independent variables are market experience, firm tenure, union membership, race, SMSA, if married, if disable, and occupation of origin. See Appendix A for full occupational titles. Absolute t statistics in parenthesis.

VII. SUMMARY.

In this paper the relationships between educational attainment, career choice and occupational mobility are analyzed. It is shown that higher levels of schooling lead to careers comprised of a smaller number of occupations, thus reducing the probability of other types of mobility (e.g., firm mobility). This negative effect of schooling decreases with time in the labor market.

Schooling has also a negative effect on the probability of upward mobility ("career mobility"). But when a control for the occupation of origin is performed, it is found that among workers in the same occupational group, the more educated are **more** likely to move up.

The schooling effect is much stronger on intra-firm career mobility ("promotion") than on inter-firms career mobility. Given firm separation, more educated workers are also more likely to move up. This observation is partially explained by the fact the among those who leave the firm, the ratio of quits to lay-offs increases with the level of schooling and also by the fact that among workers who are laid-off the more educated are more likely to move up.

It is also shown that if the returns to schooling (in term of wages) are lower while working in a specific occupation, the effect of schooling on the probability of being promoted from that occupation will be higher.

TABLE 5
MEANS AND VARIATIONS OF EDUCATION PER OCCUPATION
based on the P.S.I.D., pooled sample, males age 18-60
1976-1981

OCCUPATION TITLE	N*	MEAN	C.V.
10 PHYSICIANS, DENTISTS	59	16.84	2.15
11 OTHER MEDICAL AND PARAMEDICAL	89	16.28	9.21
12 ACCOUNTANTS AND AUDITORS	220	15.54	7.99
13 TEACHERS, PRIMARY AND SECONDARY SCHOOLS	308	16.29	6.82
14 TEACHER (COLL.), SOC SCI, LIBRARIAN, ARCH.	176	16.56	5.89
15 ARCHITECT, CHEMIST, ENG'R, PHY. & BIO. SCI.	561	15.63	10.45
16 TECHNICIANS	591	13.84	13.86
17 PUBLIC ADVISORS	230	15.01	13.99
18 JUDGES, LAWYERS	150	16.92	1.87
19 PROF., TECHNICAL & KINDRED NOT ABOVE	147	15.43	13.39
20 MGRS, OFF'C'LS, & PROPS (NO FARM), NO S.E.	2034	14.06	16.46
31 LIKE 20, SELF-EMP (UNINCORP. BUS)	550	12.24	22.28
40 SECRETARIES, STENOGRAPHERS, TYPISTS	25	13.20	13.30
41 OTHER CLERICAL WORKERS	941	12.49	16.02
45 SALES WORKERS	842	13.75	15.25
50 FOREMEN, N.E.C.	478	11.62	16.62
51 OTHER CRAFTSMEN & KINDRED WORKERS	3470	11.25	20.57
52 GOVT (FIRE, POLICE, MARSHALS & CONSTABLES)	227	12.42	14.99
55 MEMBER OF ARMED FORCES	312	13.15	15.31
61 TRANSPORT EQUIPMENT OPERATIVES	1321	10.85	22.01
62 OPERATIVES, EXCEPT TRANSPORT	2450	10.95	21.64
70 UNSKILLED LABORERS (NON-FARM)	1109	10.06	28.87
71 FARM LABORERS AND FOREMEN	268	8.53	35.93
75 OTHER SERVICE WORKERS	891	10.99	23.55
80 FARMERS (OWNER & TENANT) & MANAGERS	370	11.91	23.12
99 TOTAL	17823	12.25	23.74

N Number of observations
C.V. Coefficient of variation = (S.D./mean)*100

APPENDIX A
OCCUPATIONAL CLASSIFICATION USED IN THE PSID
Ranked by the Level of Human Capital Required to Work in the Occupation (see Appendix B)

2 digit classification

10 Physicians (Medical and Osteopathic), Dentists.
18 Judges, Lawyers.
11 Other Medical and Paramedical.
14 Teachers, college ; Social Scientists; Librarian; Archivists.
15 Architects; Chemists; Engineers; Physical & Biological Scientists.
13 Teachers, Primary and Secondary Schools.
17 Public Advisors.
12 Accountants and Auditors.
20 Managers, Officials and Proprietors (except farm), not self-employed.
19 Professional, Technical and kindred workers, not listed above.
16 Technicians.
45 Sales Workers.
31 Like 20, Self-Employed (unincorporated businesses).
50 Foremen, n.e.c.
80 Farmers (Owners and Tenants) and Managers.
52 Government Protective Service Workers (Fire, Police, Marshals and Constables).
55 Members of the Armed Forces.
40 Secretaries, Stenographers, Typists.
51 Other Craftsmen and Kindred Workers.
41 Other Clerical Workers.
61 Transport Equipment Operatives.
62 Operatives, except transport.
75 Other Service Workers.
70 Unskilled Laborers (nonfarm).
71 Farm Laborers and Foremen.
73 Private Household Workers (not ranked due to 0 observations).

1 digit classification (not ranked)

10-19 Professional/Technical & Kindred Workers.
20 Managers, Officials or Proprietors.
30-31 Self-employed Businessmen.
40-49 Clerical and Sales Workers.
50-52 Craftsmen/Foremen/Kindred Workers.
61-62 Operatives and Kindred Workers.
70-75 Laborers and Service Workers.
80 Farmers and Farm Managers.

The occupational codes are those used in the Panel Study of Income Dynamics.

APPENDIX B
The Vertical Ranking of Occupations

Consider the following wage regression:

$$\ln(W_{ijt}) = X_{it}\beta+\alpha E_i+\tau PEXP_{ijt}+\delta TEN_{ijt}+\mu RQT_{ijt}+\varepsilon_i \ , \qquad \text{(B1)}$$

where

X = a vector of observed characteristics;
E = the worker's level of schooling;
PEXP = market experience prior to entry the present occupation;
TEN = tenure in the occupation;
RQT = the amount of training the worker received in order to be fully qualified to work in the present occupation;
i = individual's index;
j = occupation index; and
t = time index.

Define the level of human capital the worker needed in order to be qualified for working in the occupation as

$$HC_{ij} = \alpha E_i + \tau PEXP_{ijt} + \mu RQT_{ijt} \ . \qquad \text{(B2)}$$

Then, the mean level of human capital needed to be fully qualified to work in occupation j is given by

$$HC_j = \frac{\Sigma i \ HCij}{Nj} \ , \qquad \text{(B3)}$$

and the vertical distance between occupations k an l is given by

$$DV_{kl} = HC_k - HC_l \ . \qquad \text{(B4)}$$

Since tenure in occupation is not reported in the PSID, it was replaced by "tenure in position." The sensitivity of the vertical ranking to different functional forms and its correlation with other measures are discussed in Sicherman (1987a).

APPENDIX C
The Data Set

The data are from the 1976-1981 Michigan Panel Study of Income Dynamics (PSID) individual tape.[14] It includes a "poverty sub-sample" but the qualitative results reported in this paper are not affected by its exclusion.

The data set contains one observation for each person in each year the person was in the sample. Individuals were excluded entirely if they were not household heads in 1979, 1980, and 1981. Data for an individual were included for a given year only if the individual was between the ages of 18 and 60.

I. NOTES ON THE VARIABLES

SCHOOLING: Number of grades completed. This variable takes on values from 0 to 17.

EXPERIENCE: Number of years worked since age 18. This question was asked only of new heads of households in 1975 and 1977-1981. Experience was imputed for years in which it was missing in the following way. First, an individual was imputed to have a year of work experience if hours worked in that year were greater than 100. Then, years worked since age 18 were computed by counting backwards or forwards from a year in which the experience question was actually asked. Also, experience was set to missing if it was greater than AGE-EDUCATION-5.

UNION MEMBERSHIP: the variable is equal to 1 if the individual is a member of a labor union, and 0 if not.

MARITAL STATUS: 1 = Married, 0 = Single, widowed or divorced.

DISABLED: This variable is equal to 1 if the individual indicates that he has a health problem which affects his ability to work, and is equal to 0 if not.

WAGE MEASURE: Reported hourly wage, on the main job, at the survey date (typically March) divided by the implicit price deflator for consumption expenditures. For hourly paid workers the number is given as reported. Salaried workers may report an hourly, weekly, monthly or yearly quantity. This value is then transformed into an hourly measure. The variable does not include individuals paid by non-standard methods such as piece work or profit sharing.

QUIT, LAYOFF, AND SEPARATION INDICATORS: The PSID contains information on tenure and separations for the years 1968-1981. However, the questions relating to these items and the coding of the responses are not consistent over the years, making it necessary to re-construct accurate measures of employer tenure, quits, and layoffs. Three major problems with the data require attention. First, tenure levels are bracketed from 1968-1974. This presents a problem for individuals with higher tenure levels, since the bracketing at higher levels is coarse. Second, in the years 1969-1974, quits are not distinguished from promotions. Third, the tenure question refers to tenure with employer only in 1968, 1976, 1977, 1978 (for individuals under the age of 45), and 1981. In the other years, the tenure question relates to tenure "on the job" (1969-1975) or tenure in position (1978 for individuals 45 or older, 1979-1980).

A lengthy computer program was written to handle these problems. The program, which will be provided upon request, filled in missing tenure data, separated quits from promotions by cross checking against other variables, and constructed measures of employer tenure in years when this information was not available.

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[14] Although the survey started in 1968, 2 digit occupational categories were not reported prior to 1976.

II. REPORTED OCCUPATION, OCCUPATIONAL MOBILITY, AND MEASUREMENT ERRORS

Individuals reported their occupation at the time of the survey, or if unemployed, the last occupation held. Occupational change is defined to occur when the 2 digit occupational category reported by the worker in two successive surveys is different. Due to measurement errors the measured rate of transitions is expected to be much higher than the real rate. The nature of the data does not allow any direct estimation of the amount of measurement error in reported occupation[15]. The following information might provide some indication to the amount of measurement errors in the PSID.[16]

The extreme assumption that the reported occupation is a pure noise was strongly rejected by comparing the observed transitions per individual with that produced by a binomial process.

An indication for the amount of measurement error can be obtained by looking at the number of cases in which individuals report a transition to an occupation held two years earlier (moving from A to B and back to A).[17] Fifteen percent of the transitions in the PSID are of such nature. Nevertheless it should be clear that such transitions are not necessarily erroneous..

While it is expected that part of the upward occupational mobility will take place within the firm,[18] an occupational change without a change in position is unlikely to be observed. Based on re-coded tenure in position, half of the occupational transitions took place without a change in position. I believe that this contradiction is mainly due to reported errors in tenure in position.

If the errors in reported occupations are random, it can be shown that in the logit estimations reported in this paper estimated coefficients will be biased toward zero, thus *weakening* the reported results. Focusing on upward transitions will only reduce the amount of errors without causing any additional bias.

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[15] Murphy and Topel (1987) and Krueger and Summers (1988) were able to get an estimate of the measurement error in reported industry in the CPS. By matching different CPS surveys they were able to detect inconsistency in reported industry and claim that up to two thirds of industry transitions could be the result of measurement errors. It is expected that individuals can more accurately report their 2 digit occupational category than the industry to which they belong.

[16] For a detailed discussion see Sicherman (1987a).

[17] Although each error in reporting occupation will cause two spurious transitions, only one will be captured in the career mobility models.

[18] Around half of the transitions are within the firm.

REFERENCES

Bamberger, Gustavo. *Occupational Choice: The Role of Undergraduate Education.* Unpublished manuscript, University of Chicago, October 1986.

Bureau of Social Science Research. *Two Years After the College Degree.* Washington D.C.: Government Printing Office, 1963.

Davis, J. *Great Aspirations: Career Decisions and Educational Plans During College.* Chicago: Aldine Publishing Company, 1964.

Flinn, C.J. and J.J. Heckman. "Are Unemployment and Out of the Labor Force Behaviourally Distinct Labor Force States?" *Journal of Labor Economics*, Vol. 1, No. 1, January 1983, pp. 28-42.

Freeman, Richard B. *The Over-Educated American.* Academic Press, New York, 1976.

Galor, Oded and Nachum Sicherman. *A Theory of Career Mobility.* Working Paper No. 51, Chicago: University of Chicago, Center for the Study of the Economy and the State, January 1988.

Krueger, Alan B. and Lawrence H. Summers. "Efficiency Wages and the Inter-Industry Wage Structure." *Econometrica*, March 1988, pp. 259-293.

Miller, Robert A. "Job Matching and Occupational Choice," *Journal of Political Economy*, Vol.92, No. 6, 1984, pp. 1086-1120.

Mincer, Jacob. *Education and Unemployment.* New York: National Center on Education and Employment, Teachers College, Columbia University, December 1989.

Murphy, Kevin M. and Robert H. Topel. "Unemployment, Risk, and Earnings: Testing for equalizing Wage Differentials in the Labor Market," in *Unemployment and the Structure of Labor Markets*, edited by Kevin Lang and Jonathan S. Leonard. London: Basil Blackwell Inc., 1987.

Rosen, Sherwin. "Learning and Experience in the Labor Market." *The Journal of Human Resources.* VII 3, 1972, pp. 326-342.

Sicherman, Nachum. *Occupational Mobility and Human Capital Theory.* Unpublished doctoral dissertation, Columbia University, 1987a.

Sicherman, Nachum. *Over-Education in the Labor Market.* Working Paper No. 48, Center for the Study of the Economy and the State, University of Chicago, August 1987b.

Slocum, Walter L. *Occupational Careers, A Sociological Perspective.* Second edition. Chicago: Aldine Publishing Company, 1974.

Sommers, Dixie, and Alan Eck. "Occupational Mobility in the American Labor Force," *Monthly Labor Review*, January 1977, pp. 3-19.

Spilerman, Seymour. "Careers, Labor Market Structure, and Socioeconomic Achievement." *The American Journal of Sociology*, Vol. 83, No. 3, November 1977, pp. 551-593.

Wise, David A. "Personal Attributes, Job Performance, and Probability of Promotion.", *Econometrica*, Vol. 43, No. 5-6, September-November 1975, pp. 913-931.